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ABSTRACT

This paper discusses a cognitive model of how action agendas and goals emerge through the dynamics of self-organization in collaborative activities. While machines are designed to perform a function, or goal, humans are self-organizing systems that set their own goals and produce order without having external order imposed on them, or, more precisely, they participate in ever larger self-organizing supersystems in which there are always new, emergent goals at each stage. As actions occur, they change the possibilities for further action, and goals change along the way. An example of this process is offered: grade 4-5 students in a science class were videotaped as they attempted to build a tower out of plastic soda straws and pins. There was no "problem" to be solved, only the "vagueness" of the activity; no agenda of problem solving, until a problem was created by the joint "actions" of the participants, including the inanimate objects. Though at the outset the problem is vague, "build a tower," problems and goals become more specific as the activity progresses into the specific activities of construction. In principle, the course of collaborative activity is not predictable; at each moment the probabilities for various subsequent happenings can be imagined or estimated. But as they happen and create the conditions of possibilities and likelihood for what follows, in turn, new orders or agendas, are created in the developing system. The paper concludes that consideration of emergent agendas in collaborative activity may prove fruitful of new and useful analyses. Transcripts of the video tape segments are attached. (Contains 15 references.) (ND)

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EMERGENT AGENDAS IN COLLABORATIVE ACTIVITY

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Activities and Goals

What unifies an activity? What principles can we use to assign to the various constituent actions of 'an activity' to a single unit of analysis? In the Vygotskyan model of Leontiev (1978), and in many other influential views, activities are 'goal-directed' or 'object-oriented' and it is their several relations to the goal or objective of an activity which unifies its constituent actions.

One of the consequences of such a theoretical model is that any change in the goal or objective associated with an activity must be seen as a change in the basic nature of the activity itself. The topology of activities, which ones we see as 'nearer' (more alike) to others, and the topology of the associated goals may not be smooth images of one another. Perhaps a small or even a relatively large change in our goals does not imply a change to a significantly different activity. Perhaps different activities can share the same, or very similar goals.

I want to present an alternative viewpoint, one in which goals are emergent in activity. In this view, activities are viewed as the functioning of self-organizing systems of social practices (cf. Lemke 1995), in which persons and other actants (cf. Greimas & Cortes 1982, Latour 1987, 1988) participate. They are unified by the interdependence over time of the actions: the fact that what happens next depends on what is possible given what happened before, in indefinite logical regression (and actual, indeterminate dynamical progression). As actions occur, they change the possibilities for further actions, and goals, however we shall define them (see below), change along with the whole always-emerging dynamics of the activity.

Self-organization models are somewhat counter-intuitive for those of us raised in machine cultures where cybernetic models yield satisfactory accounts. A machine is created by design, it is designed to perform a function (its 'goal'), and it is considered well-designed in modernist European culture if it performs this function despite changes (within limits) in its environment of operation (its 'tolerances'). The great cybernetic paradigm machine is the thermostat

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(originally the steam engine regulator, now too far in our past). It compares the present temperature to the pre-set desired temperature, and it opens or closes a circuit to the heating or cooling system in such a way that things are heated or cooled to that temperature. But someone, outside the functioning of the machine, must set the desired temperature. The goal is external to the operation of the machine.

Humans, on the other hand, are believed to set their own goals, at least some of the time. Even the body thermostat, set to 98.6 Fahrenheit degrees, can reset itself in times of fever or chills, and came to be set as it normally is as the result of some complex self-organizing process we call evolution (peculiarly recapitulated in individual ontogeny: young children have a different normal temperature than adults). Self-organizing systems preserve and produce order without having external order imposed on them, or, more precisely, they participate in ever larger self-organizing supersystems in which there is always new, emergent specific order at each scale, including that of the level of focus (say the organism). Self-organizing systems in general require at least somewhat orderly environments, but the order at their own scale as a unit of analysis is not determined by that external order, but is contingently emergent from it (i.e. from the complex mutual interdependencies of many processes at smaller and larger scales which dynamically constitute the system as system at the level of interest).

Machines are really just nonhuman participants in human ecosocial systems; they order and goal-directedness is an epiphenomenon of the self-organizing processes in human social ecologies that get them made and used in the environments where they 'work'.

Self-organizing systems thus have orderly, and even what appears to be goal-directed behavior, but they do not have external goals, nor do they have internal ones. This last is even more surprising: there is no internal model of the goal. There is no internal locus of control. Control in such systems is a <u>distributed</u> phenomenon; it results, like everything else, from the patterns of connectedness, the auto- and cross-catalytic cycles of interdependence, of constituent processes. Behavior just 'happens'; it is not planned, it is not controlled from some goal-defining site, either internal or external.

This is rather contrary to our own cultural folk-models of behavior. We are taught linguistic semantic strategies for speaking about ourselves as persons who think, who plan, who act with goals in mind. We seem to ourselves, when we conceptualize our behavior in these terms, to be doing just this. I am not denying that we do it, that we formulate what we call goals and plans. But the best-laid plans 'gang aft aglee', and whether for mice or men, behavior continues, life goes on. Goal-directed rationality is a cultural prejudice, and a cultural illusion. Behavior, action is always contingent. There are, no doubt, routines that we recapitulate fairly often. We ignore the uniqueness of each doing, and convince ourselves that we have managed to get where we planned to go. It might be more useful to say that we remem-

ber having done something of the sort before in a rather similar way. But we manage quite well, thank you, when the unexpected happens, as it nearly always does.

So strong is our cultural norm for ends-means rationalization of behavioral sequences that we tend, often unconsciously, to assimilate immediately past behavior, retrospectively, to some action-toward-a-goal model. We say, when all is done, that all we did, we did to get where we in fact got to. But had we gotten somewhere else, as was in fact quite likely, then we would see that as where we were going all along. Prospectively we nest our goals in layers of ever greater abstraction, so that there is always some layer in reference to which we will be able, afterwards, to say that this goal remained invariantly our heading, despite all the vicissitudes of what actually transpired.

In the episode I want to offer as an example, previously analyzed for a different purpose, three students are 'building a tower' with plastic soda straws and pins. At the level of abstraction at which we can semantically create such a construct as 'building a tower' there need be no very specific notion of what this tower will look like, or what we are actually going to be doing to build it. Within very wide limits we can look back at whatever we did, and at whatever edifice resulted, and say, yes, this is the tower we were building all along. But of course it wasn't. What we were actually building, both as it seemed at the time, and as we envisioned it becoming, changed many times along the way -- which we conveniently overlook.

People of course can program themselves to act like the machines they build, and in some cultures we try to do this. And sometimes it seems to work: we set a very specific goal and we proceeded exactly to it, and there was nothing unforseen, or at least nothing so drastic that it forced us to change the goal in any way that is significant to us. But these are exceptional; they are not what human beings have evolved to be good at. They also privilege a very culturally specific emphasis on 'outcomes', on end-products or results, and subordinate to this emphasis any concern with the primacy of action itself. If the results are the same, that is all that matters: we have 'achieved the goal'. But we are built of processes, we live in and by processes, reality for us is what we do, what happens. It is a very narrow focus to look at where our journeys take us, and to ignore the journey itself. It makes for a very pinched happiness for a very few, who achieve the great cultural goals, 'success' by some arbitrary standard. It leaves no accounting of the lives that were lived, that led to this end, or to other ends. Does it matter so much where we end up? In the end of ends, in death, are we so different from one another? It is our lives that are different, the pathways and trajectories we have made in our living, moment-by-moment. How shall we judge our lives, by ends or by livings? And how shall we conceptualize our behavior, by goals or by the ways in which every aspect of our behavior has emerged from our moment-to-moment participation in the lifesystems we belong to?

I am not talking here merely about theory or science. I am talking about cultural values, because I believe that our theories about our

own behavior serve these values, and that better values and better theories must come hand in hand.

Goal-direction and Object-orientation

There is a more ecological and dynamic interpretation of the Leontiev model. It is not in fact truly a cybernetic model (though many similar models are), because it takes as the paradigm of goal-directedness the orientedness to an object of elementary motor behavior. When the child or the chimp reaches for the desired object (how did it become desired?), grabs the pole, gets on the ladder, cries to mother for help, etc. there is an external and fixed, invariant object toward which it strives. Here is a very material notion of goal (which is otherwise almost entirely a mentalistic, idealist notion): we are oriented to the object itself. All our actions can be seen as unified dynamically (and not merely in fanciful rationalization) by their orientation to the common object.

Is the object invariant? Naive realism takes the invariance of the supposed physical object, independent of its interactions (no longer a viable notion in modern physics), to be identical with the object-that-is-oriented-to. But from the interactional perspective, the object changes: as we get closer to it, it changes as a percept, we notice new things about it that may change how we next try to get at it. As we have been longer striving after it, it may come to have a different affective significance (more or less, positive or negative, or both), and that too may influence our next efforts. How it seems to us when mediated by one tool or another, by one or another effort to descibe it semantically or visually, by the whole cumulative sequence of past mediations, matters to the actions that follow, matters to the matter of how we are oriented to 'it', what 'it' is in respect of the orientedness of our actions. How does it seem when it is just a bit further away than the length of our pole? How does it seem if I construct it verbally as being on a shelf, capable of being rolled off it? How does its roundness seem as part of a mere visual representation of shape, vs. how it seems when roundness is connected semiotically (by sentence or visualization) to the possibility of rolling off?

The oriented-to 'object' is not invariant for purposes of analyzing the succession of behaviors oriented to it.

It is also, clearly, not merely a material object; it is a semiotic-material object, an object dually endowed with meaningful properties as a material object in some material discourse, and with all the additional meanings that may be ascribed to those properties, or to the object as a constellation of its properties, in other discourses. (Discourse here stands in for its generalization across all semiotic resource systems; 'properties' for some more appropriate notion of semantic/semiotic valences, redundancies, etc.).

Object-orientation is thus a much more useful notion that goal-directedness, if we interpret it this way, but we need to embed it iwthin an even more complex view in which the object-orientation itself is an emergent aspect of the self-organizing dynamics of behavior-in-context.

Analyzing Collaborative Activity

If all this is so of the actions of a single organism, of the interactions in a system in which this organism participates, but which also includes its tools, artifacts, and the rest of its ecological environment, mediated for purposes of behavior by the ways it uses semiotic resource system to assign meanings to things and events, how much more so it is for systems with more than one person constituting them.

The view I take is not that systems are made up of people and things, but that they are made up of processes, practices, actions, doings, and happenings. The people and things are participants in these processes. It is the processes that are complexly interdependent, which form the matrix of self-organization of the system, which define its systemhood. The human does not so much 'act' in this view, as participate in happenings, almost all of which, for purposes of our present interest, represent interactions or transactions that are grounded in some system larger than the organismic body. Of course there are a lot of smaller scale processes happening within that body, and it is the relations between these and those that comprise the interactions of the body with the rest of the system, which constitutes the mystery of what really happens when humans 'act'. There are no processes at all which are specific to what we call 'the individual' as an organic whole. That is a purely ideological construct; it is a discursive construction, important in legal and moral and other discourses of some cultures, but it is not a level of analysis in the sense I am describing. All the relevant processes for the analysis of the system are either at constituent scales, in the sense of smaller scale than the organism, or at interactive-constitutive scales, in the sense of larger than the organism. Indeed most processes are both, or need to be analyzed in both senses. In a world where everything is process, entities cannot be fundamental units of analysis, not even human individuals.

No one yet has a consistent process discourse for describing human behavior (or anything else, except perhaps some esoteric aspects of physics), and the semantics of our languages militates against this. Where there are processes, there are participants. Where there are verbs, there are nouns. It is the focus that needs shifting, to see the participants as defined by their participation in processes, and to see them as aspects of the specification of the process. It is not, in fact, the verb that specifies the process: it is the whole clause that does so. So, with this warning, I will often use conventional terminology in describing the following episode of collaborative activity. Energetic readers can try to upgrade the account toward something more with a more consistent process focus.

Three grade 4/5 students in a science classroom in Canada are in the midst of an engineering unit in which they are expected to build some sort of a tower out of materials provided. Fuller accounts of this class and the research methods which produced the videotape from which our focal segment below is excerpted can be found in Roth (in press). After analyzing their interaction using several sorts of semiotic analysis tools, I want to comment explicitly on the emergent quality of their agendas in 'building a tower'. Thoughtful readers will, I hope, be way ahead of me by the time I do.

Thematics in Collaborative Activity

Simon, Tim, and Andy are standing around a small table. They are talking and manipulating small constructions made by gluing or pinning segments of plastic soda straws together in various two- and three-dimensional geometric shapes. On the table is a larger construction of this kind, some straws, and a scissors.

In the Analytical Transcript (Table 1, appended) I have visually separated the three participants' contributions into separate columns. In the print version (not in the electronic one, unfortunately), I have indicated by arrows to which prior contribution a later one refers, usually as challenge or agreement. I have also highlighted the key thematic items, such as SQUARE and PYRAMID. (Brackets indicate something not explicitly said, but thematically implied or thematically equivalent to what was said.) For a more customary transcription, see the final appendix. For methods of thematic analysis, see Lemke 1983, 1988, 1990.

The first part of the transcript is from the time just before the opening of our focal 'Problem Solving' episode. It highlights Tim's introduction of the term CONE-TOP and his 'ownership' of it and defense of the relevance of this construction when Simon says they can't use it, yet. The last section follows the focal episode and shows, rather more loosely, how some of its themes are distributed among the participants soon after.

Thematically, the most interesting feature of the transcript for me is that particular thematic items are closely associated with particular participants, and some of them then 'migrate' to the columns of one or both of the others. The patterns of who is using 'whose' words are very interesting in relation to Bakhtin's notions of dialogicity in discourse (1935, 1953), as well as providing an initial take on the thematic aspects of the <u>interaction</u> among the students. What does the discourse tell us about how key thematic terms, and the concepts whose use they represent, pass back and forth, or don't?

CONE or CONE-TOP is associated with Tim. No one else uses this term but Tim until well after the end of the focal episode, when suddenly, after being reintroduced by Tim after a long absence from the dialogue, it is taken up by both Andy and Simon.

PYRAMID is associated with Simon. Andy echoes it after Simon first introduces it (lines 4,5), but otherwise no one else uses it again except Simon.

SQUARE is introduced by Andy as a follow-up to his single echoing of PYRAMID (line 5). He reintroduces it in line 22, when it gets taken up at first tentatively (line 23) and then substantively (line 25) by Tim.

CUBES is also introduced by Andy, and 'adopted' by him (lines 26,28). After the focal episode, it is reintroduced by Tim, and then used by all three. Soon after, exactly the same thing happens to CONE.

It is striking how these words become associated with a particular speaker and then are either immediately or only long after taken up by others. Thematically, we can pose the question of how well these chains of words indicate the use or non-use by each individual of the corresponding concepts, and also what the thematic and conceptual progressions are by which the actual thematic sequence develops.

So, for example, how is SQUARE in line 5 conceptually linked to PYRAMID? Do Simon and Andy share the same concept, differently expressed? Does Andy extract from Simon's use of PYRAMID a key feature, the SQUARE base? Is his later use of SQUARE (line 22) also cued by Andy's PYRAMID in lines 19,21? The term and concept SQUARE are used in relation to different visual-tactile objects in line 22 from lines 5 and 24, and a key link is made by way of this thematic item from the meaning in line 22 to that in 24 (SQUARE bottom for the CONE-TOP vs. SQUARE top of the base of the tower).

What is the conceptual relation of SQUARE to CUBES in lines 22-26? How does this get constructed in the activity itself?

We will come back to these questions later, but first I want to consider the social-interactional dimension, the making of 'withs' that is going on simultaneously with making these thematic chains and exchanges.

Looking just at the transcript, we have an episodic subdivision that is based on both thematic and social-interactional criteria. Major activity boundaries normally correspond to discontinuities by both kinds of criteria; units are integrated across minor boundaries by continuity in one or both (Lemke 1995b). The pre-focal section highlights a little exchange between Tim and Simon. Tim claims a kind of status and glory for his part of the project and is taken down a peg by Simon. The focal episode is subdivided into four main sections and a coda. Each of these sections begins with a contribution by Tim, followed by the responses of the others and some interaction.

In the first of these (lines 1-5), Tim proudly announces that he's made his CONE-TOP. This time it's Andy who deflates him. Simon sup-

ports Andy in his claim that the triangular bottom of the CONE-TOP won't match the square base of the tower, a pyramid shape would be better.

In the second (lines 6-15), Tim offers a solution: just attach it with support straws. This gets two objections, one from Simon (too hard) and one from Andy (won't look good). Simon and Andy support each other's objections. Tim denies them. Finally Simon says the support straws solution won't work.

Now (lines 16-24), Tim offers another solution: cut it down. This meets agreement from the others, but it is not clear thematically what it means. Andy offers 'cut the bottom' but Simon reintroduces PYRAMID (line 21), and Andy adopts this in the form of saying the 'bottom needs to be SQUARE'. He now has a dialogue with Tim, from which Andy withdraws, in which he first explains why and what he means Tim should do, and then responds to a new initiative from Tim.

In this last section (lines 25-28), Tim offers a difficulty, that the SQUARE bottom of the CONE-TOP would be a lot smaller than the SQUARE top of the tower's base, and Andy provides a solution (gradually smaller CUBES from base to CONE-TOP). Tim agrees to this plan.

In the Coda, Simon initiates a brief consideration of further details (how many cubes, the basic shape of the tower).

In the post-focal section it becomes clear that they all accept the basic BASE-CUBES-CONETOP plan.

The Non-Verbal Dimension

The social-interaction aspects of the episode are signalled not just verbally, but also by the proxemic and kinesic patterns of the students' activity.

In the pre-focal section, Tim was partway up on the table, leaning into the dyad of Simon and Andy, who were facing each other across the bottom of the table (see appended diagram in print version). They were a fairly tight group, and this unity was defended against Stephen who briefly intruded, even sticking his head into the center of the group. Tim and Simon orient to each other in the section in the transcript.

In the focal episode, however, Tim gets down to pick something up and then stands, facing into the camera, more distant from the Simon-Andy dyad, as he announces his creation of the CONE-TOP. During the three sections in which he is at verbally at odds with Simon and Andy, they are proxemically close and very cohesive with one another, excluding Tim.

This changes at about line 22-24, when Tim comes around next to Simon and facing Andy. Their interaction changes from argumentative to col-

laborative at this point, as Andy explains to Tim about the SQUARE match-up. As their exchange continues into the fourth section, they orient more and more to each other, get closer across the table, and Simon withdraws, moving back from the table, doing his own thing. The structure of interaction has now changed completely from Tim vs. Simon and Andy to Tim and Andy vs. Simon (not in the sense of opposition, but of proxemic grouping and spatial-attentional orientation).

In the Coda, Simon rejoins the discussion, but by this time Tim and Andy have both retreated somewhat from their close-knit 'with' to their separate division of labor.

The post-focal proxemics was not available on the section of the video sent for analysis.

What we see here is the very close synchronization of the changing verbal relationships, both social-interactional (i.e. rhetorical, as in agreements and disagreements) and thematic (in terms of taking up the thematic items of others), with the changing nonverbal (proxemic and orientational) relationships. Each is clearly abetting the others, and the optimal unit of analysis here is clearly the whole action-stream.

Problem-Solving: Situated Cognition and Emergent Agendas

With all these pieces in place, let's go back now to the central interest of the episode for our present purposes: the formulation and solution of the problem of how to connect the CONE-TOP to the SQUARE base of the tower.

The notion of 'problem-solving' is of a piece with the notions of goal-directedness and end-means rationalizations of behavior that have already been critiqued. Like the 'object' to which motor behavior may be oriented, the 'problem' too changes as we come to redefine in light of the ongoing action of trying to solve 'it'. The criteria of what will count as a solution to 'the problem' also tend to change in ongoing activity. If 'building a tower' is the rather indefinite goal-defined form of the activity here (though obviously this characterization overlooks a whole world of other goings-on in this episode), then 'fitting the cone-top to the square base' is the parallel 'problem' which is focal in this episode. But it was not a problem at the start of the episode. It was constructed as a problem by what happened in the episode, and so likewise emergent is the strategy for solving it and what counts as a solution.

I want to describe the action in relation to this emergent 'problem-solving' agenda in terms of the semiotic resources available and their situated deployment. I want to argue, in effect, that the immediate material situation itself: the co-presence of the three students, the visual-tactile constructions of the tower-base, cone-top, etc., and even the presence on the table of a scissors, as well as the linguis-

tic resources of thematic items/relations and interactional speech-act types/rhetorical genres, abets and facilitates, enables and shapes the actional sequence which we interpret as problem-solving.

This is a 'situated cognition' (cf. Lave 1988, Lemke in press) model, but one in which we are not talking in terms of folk-theories of 'minds' or interior 'mental' operations, but in terms of meaning-making as material activity deploying objects-that-are-also-signs (including words) according to the generative semiotic codes of a community. This is an 'ecological' view of social cognition, or, to cut out the middle-man, an _ecosocial_ view of collaborative semiosis. I will argue, in the end, that a view of what has been called 'cognition' as situated and distributed material semiosis aptly describes one important aspect of the dynamics of self-organization in collaborative activity and its emergent actional agendas.

I will only sketch the overall synthesis in these terms of the analyses I have already made; a complete discussion would become very long and complex, and we would lose the forest among the trees.

When Tim announces (line 1) that he has made the CONE-TOP, he is holding it. He says he has made it, having in fact just made it by attaching the last parts to each other. It is 'made' in the sense that it holds together as a single coherent object, and it is just when it has been made to do so that Tim presents it as an object, a named entity (semantically a Thing, a count-noun), a thematic-conceptual item, the CONE-TOP. It is a complex material object, a linguistically named entity, an 'idea' in the sense of a thematic element, and when 'presented' to the group, it becomes a sort of participant (an actant in Greimas' or Latour's semiotic usage).

The cone-top is visible, foregrounded, visually prominent now, and seeing it, having just been seeing and touching and manipulating the base of the tower, for Andy the juxtaposition in time, space, and immediate experience of the tower-base and the cone-top makes possible a contrast. One has a TRIANGLE (2a), the other is all SQUARES (5). Andy foregrounds this contrast and turns it into a 'problem' (line 2c) at the same moment he constructs the contrast itself verbally. Simon weighs in with something now that is not visible, a purely theoretical-imaginary, and possibly visualized PYRAMID (line 4). I do not know if this word had recently been used before this episode. One would have to trace its intertextual provenience. But both word and visualization are themselves semiotic operations; they depend for their meaning on verbal-semantic and visual-representational systems of semiotic relations across texts and images in a community.

Tim makes two proposals to save his cone-top. First he proposes to attach it by 'supports' a term we can be sure had been recently used, and associated no doubt with the building straws. It is a generic sort of solution, and it is very likely enhanced by (a) the presence of loose straws around, and (b) the habit, just enacted, of attaching straws together to build what is wanted. It is a small extension of

what he has just been doing. The second proposal is made just as he sees and reaches for a pair of scissors on the table between him and the his opponents, between the cone-top and the tower-base (the two items which need to be connected). It is to 'cut it down', though it is not clear what that means or how it would solve the problem. It arises as a proposal at least in part from the co-presence of the scissors and their coming into attention in connection with the formulation of the problem as a CONE-TOP / TOWER-BASE relation and a TIM / SIMON-ANDY relation.

There was no 'problem' to be solved, no agenda of problem-solving, until a problem was created by the joint 'actions' of the participants -- all the participants, including the inanimate ones. Andy's initial comment about the triangular base of the cone-top elicits a 'So?' from Tim. It takes work to make a perceived and declared contrast, a difference (triangle vs square) into a 'problem', i.e. 'a difference that makes a difference' (cf. Bateson 1972), and a negative difference at that, relative to the Building-the-Tower agenda. The problem-solving agenda is emergent in the sense that both the existence of a problem, and the perceived need to solve it, and the actions that can retrospectively be seen as contributing to its solution, are all contingent: they all happen as sequents to previous actions that might have been different.

There is no very clearly articulated solution to the problem from those who pose it (Andy and Simon). Their proposals, like Tim's, are oriented to the immediate visual-tactile object of the cone-top, to do something to it to repair the triangle-square mismatch. It is in fact another problem that leads to a solution in the larger context of the agenda of building the tower, the agenda in relation to which the mismatch was construed as a problem ('gonna be hard to put on' line 2c). It is Tim's visualization, cone-top in hand, scissors in hand, building straws at hand, building experience so immediately in memory, the SQUARE-ness of the tower-base so salient, the work actually begun, of what his cone-top might look like with a square bottom, that leads him to enunciate a forecast (line 25): 'its gonna be a small square'.

This forecast is taken up by Andy as another problem. Tim has made another contrast: small vs. the large square top of the tower-base. In the foregoing context of how to put it on, this contrast becomes another problem. Andy, in line 26, acknowledges it as a problem ('So') by offering a solution: '... we'll make a lot of cubes and make them all smaller'. Like Simon's earlier use of PYRAMID, we don't immediately know the local intertextual provenience of CUBE here. Is this the work of visual imagination alone? Does it echo some earlier theme in their work? We do know that Andy is the one of the three who has just been intimately engaged both with the tower-base (working on it with Simon) and with the cone-top (analyzing it with Tim). He is the one who has most fully articulated verbally the nature of the mismatch problem, whose domain is the CONE-TOP/TOWER-BASE relationship. The tower-base itself is vaguely cubical; I don't know just what Simon has been working on ('Tyler's thing'), which was salient for Andy during their preceeding 'with'.

In any case line 26 is a thematic nexus, a point where, at least implicitly, in terms of the thematic formations needed to interpret its meaning intertextually (cf. Lemke, 1990; 1995b), all the thematic relations of the dialogue become interconnected. It is a sort of 'synthesis' point. My interpretation of it is that CUBES carries forward the theme of SQUARE (base, bottom, tower) in the context of the three-dimensional constructions they are working with, and that SMALLER picks up Tim's previous 'small square' in relation to the implied LARGE/SMALL mismatch Tim has projected. What is new is the PLURAL: that there can be more than one CUBE, each smaller than the last, with the largest matching the LARGE-SQUARE of the tower-base, and the last smallest one matching the SMALL-SQUARE of the cone-top. It is in fact the issue of PLURALITY that is taken up by Simon in the Coda, and which is very prominent in the post-focal section ('last cube' 'two cubes instead of three' 'just do one cube' etc.).

I do not see them drawing any pictures. It is not clear just how well they have formulated a visual model of the finished tower. I believe that at the end of the focal episode, the tower-to-be is still somewhat contingent, not fully specified semiotically. Tim's view of it as like the 'Empire State' (a classic step-back design built around rectangular prisms in a sort of 'wedding cake' style) is as close as they come verbally at this point. But the Empire State model does not quite accomodate a 'cone-top', even a pyramidal one (like the Transamerica building) and Tim later seems to conflate Empire State with something that does taper in this way, the Eiffel Tower.

The problem of fitting the cone-top to the square base, and the problem of building the tower have merged at this point. The solution to the problem that wasn't a problem when the build-a-tower goal and plan were initiated is now at work determining what this thing they are building will actually be. The material form of the tower is emergent in the collaborative activity of doing something like 'building a tower'. 'Building a tower' is a verbal essay at formulating what is going on, rationalizing the activity as goal-directed. But what does it mean to the participants? At what level of abstraction do they agree on what they are doing? Certainly not yet at the level of specificity that would be represented even by a common drawing or sketch of the finished tower. There is an important lesson here about the usefulness of semantic vagueness in language. 'Abstractness' is all very fine as a characterization of the usefulness of having one word for many different objects, but 'vagueness' is more what is operative here, where different individuals can agree on an activity that is no more specified that the least definite meaning of these words, 'building a tower'. But that is enough for a start, enough to get the ball rolling, to get the collaborative system of activity going. From there on it will self-organize, new definiteness of meaning will emerge, semiotically and materially, throwing up agendas also specified in these emerging terms.

The emergent agendas of collaborative activity may be those defined by the analyst, or those articulated by the participants (who may not

even agree on them except at some level of 'vagueness'). But they will be articulated semantically and semiotically, by words, by gestures and sketches. As agendas, they are semiotic formulations, whether simply as actions that make further actions possible, or as cultural rationalizations for emergent meaningfulness under the heading of familiar or invariant goals and activity-types. They occur in an entirely situated fashion: from moment to moment, as the immediate ecological context is produced by prior actions, what is formulated depends on the presence of the actors, their embodied actions (including speech, gestures, etc.), the available materials and tools, the already produced artifacts, etc. The semiosis of meaningful doing, and the semiosis of formulating a particular kind of meaning for this doing (i.e. as pursuing an agenda) are activities that occur in the whole material system just described; as processes they are distributed in this system, even though some of their material participants may seem to be localized to the speech or gesture of this or that body, or not (e.g. to be inherent in the interaction of a body and a tool and an artifact all at once).

The course of this collaborative activity was never in principle predictable. At each moment, we can imagine and perhaps even estimate the probabilities for various next-happenings. But as these happen, and create the conditions of possibility and likelihood for what follows them in turn, new kinds of order are created in the developing system. We can only make sense of what is going on, as it is going on, by reference to other sequences of similar contexts and events that we have experienced or semiotically constructed. We assimilate each temporary phase of the developing collaborative activity to some familiar pattern, but we cannot know which such pattern will have become the relevant one several minutes later. And sometimes it happens that entirely new and unprecedented behaviors, constructions, logics, theories, rationales, or agendas emerge. We may dismiss them as nonsense, as meaningless; we may not even be able to notice them as phenomena -- unless they are repeated, or semiotically formulated so as to become meaningful, and perhaps even added to the repertory of patterns of behavior-in-context that make sense in our community.

I hope this way of talking about emergent agendas in collaborative activity may prove fruitful of new and useful analyses.

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TABLE 1. ANALYTICAL TRANSCRIPT OF THE 'TOWERS' VIDEO SEGMENT

Thematic Chains and Social Interactions

SIMON/Serge	TIM/Tyler	ANDY/Adam
Pre-Focal:		
[Not use yet]	Making CONE-TOP	
	Can use CONE-TOP	
Not yet	I know	
...		
Focal 'Problem-Solving' Episode:		
	1. CONE-TOP	
	2b. So?	2a. TRIANGLE on bottom
		2c. Hard to [attach]
4. Make PYRAMID		
		5. A PYRAMID All SQUARES [on base]
	6. Supports [to attach]	
8. No, too hard		7. No
		9. [No,] Too hard
	10. No [vs. 8,9]	
11. [No vs. 10]		13. [No,] Won't look good
	14. [No to 13]	
15. No, won't work [vs 6]		
	16. Cut it down?	
17. [Yes, cut]		18. Cut bottom
19. Make PYRAMID		20. Cut bottom
21. Make PYRAMID		
	23. SQUARE?	22. Bottom [must be] SQUARE
		24. All SQUARES [on base] (cf. 5)
	25. ...<u>small</u> SQUARE	
		26. So CUBES all smaller
	27. OK, I'll make [TOP]	
		28. I'm making CUBES
29a. Make 3 layers		29b. NOT! [vs. 29]
	30. Make like Empire State	

Post-focal:

You make CUBES	
	S making CUBES
Need 3 [CUBES]	
	Mine last CUBE?
Last CUBE small	
Needs CUBES	
2 CUBES vs 3	
I got CONE shape	
	Want CONE for top
I know ... CONE	
...CUBE...	
	...CUBE...
...CUBE...	

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FOCAL 'PROBLEM-SOLVING' EPISODE (Rough Transcription)

1. Tim: See, here's the cone top [3sec]
2a. Andy: (but there's) a triangle on the bottom
2b. Tim: So?
2c. Andy: That's gonna make it hard to put it ON
3. Tim: (unclear)
4. Simon: Make a pyramid. Make a pyramid out of it.
5. Andy: A pyramid. And look, all these are squares here
6. Tim: Yeah, but we can just put a few supports like that and then put it on
7. Andy: No=
8. Simon: =Not really, that is too hard, fellas
9. Andy: It's too hard
10. Tim: No it isn't
11. Andy: Yes it is

12. Tim: You only (need)

13. Andy: It won't look good (then)

14. Tim: (Yeah, it will)

15. Simon: No, it won't work.

16. Tim: What, you want me to cut it down? [2sec]

17. Simon: That would work

18. Andy: Cut down the bottom

19. Simon: Just make a pyramid

20. Andy: Just cut down the bottom

21. Simon: All you have to do is just make a pyramid

22. Andy: The top, the bottom needs to be a square

23. Tim: A square?

24. Andy: Look, these are all squares [2sec]

25. Tim: You just need one thing there [8sec]
It's gonna be a SMALL square [2sec]

26. Andy: So we'll make a lot of cubes and make them all smaller [2s]

27. Tim: OK, you guys get started and I'm gonna make this

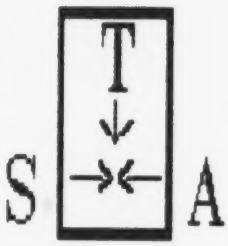
28. Andy: I'm making cubes [4sec]

29a. Simon: Make it 3 layers high

29b. Andy: NOT.

30. Tim: Let's make it sort of like the Empire State Building

PRE-FOCAL:



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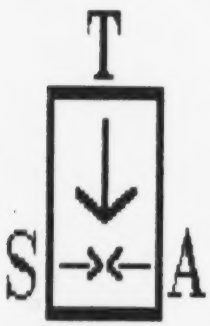

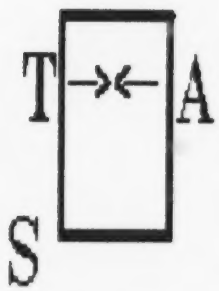

POST-FOCAL: